

CHE Chemistry End-of-Course

DynaNotes™ Review Guide



DYNA NOTES
 TOOLS FOR EXPLOSIVE LEARNING

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Symbol indicates section aligns to Texas College and Career Readiness Standards.

Category 1 – Matter and the Periodic Table

CHANGES AND PROPERTIES

Change	Description	Examples
physical	change in size, shape, or state; remains the same substance	boiling water, chopping wood
chemical	new substance is made; bonds between atoms are made or broken; often see a color change, temperature change, or the formation of gas or precipitate (solid)	electrolysis of water (to H ₂ , O ₂), burning wood (makes H ₂ O, CO ₂)
Property	Description	Examples
physical	can be observed without changing the substance into a different substance	boiling point, color, density, solubility
chemical	can be observed when a substance changes into a different substance	reactivity with O ₂ , flammability, toxicity

STATES OF MATTER AND PROPERTIES

Property	Solid	Liquid	Gas
compressible	essentially no	essentially no	yes
shape	fixed	container's shape	fills space
volume	constant	constant	can change
structure	forces keep particles in a rigid structure	intermolecular forces keep particles together but allow movement	particles move freely, no forces

extensive property: dependent on sample size **Examples:** mass, volume
intensive property: independent of sample size **Examples:** density, boiling point

SUBSTANCES AND MIXTURES

atom: smallest complete part of an element **Example:** Helium atom
element: substance made of one kind of atom **Example:** Chlorine (Cl)
compound: substance made of two or more different elements **Examples:** H₂O or NaCl
substance: contains only one kind of matter; no two substances can have identical chemical and physical properties; can be broken down into different parts using physical means
Examples: element like iron (Fe), methane (CH₄)
mixture: combination of two or more substances in which each substance maintains its own properties; a mixture can be separated using physical means

Example: In a famous story, Archimedes determined whether the king's crown was made of pure gold. He had a mixture of metal with a lower density than gold. He knew that if it was pure gold, it would sink in water. He found that it was not, so it was a mixture.

PERIODIC TABLE DEVELOPMENT AND FEATURES

(number of protons) → 2
 symbol → He
 atomic mass (protons + neutrons) → 4.003
 name → Helium

• atomic radius decreases left to right (across) →
 • electronegativity increases (excluding noble gases) →
 • ionization energy increases →

Group	1A	2A	3A	4A	5A	6A	7A	8A
Period 1	H	He						He
Period 2	Li	Be	B	C	N	O	F	Ne
Period 3	Na	Mg	Al	Si	P	S	Cl	Ar
Period 4	K	Ca	Sc	Ti	V	Cr	Mn	Fe
Period 5	Rb	Sr	Zr	Nb	Mo	Tc	Ru	Rh
Period 6	Cs	Ba	La	Hf	Ta	W	Re	Os
Period 7	Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs
Lanthanide Series								
Actinide Series								

PERIODIC TABLE DEVELOPMENT AND FEATURES

In 1869, Mendeleev organized known elements in order of their atomic weights, grouping those with similar properties (like Li, Na, and K which all react violently with H₂O to produce H₂ gas). Over time, other scientists added to his work to create the periodic table (now organized by atomic number).

valence electrons: electrons in an atom's outermost orbital shell; can be gained, lost, or shared in chemical reactions
periodic table: chart of elements ordered by atomic number and grouped by number of valence electrons and physical properties; properties vary predictably in the table (periodic law)

row or period: elements are in order of increasing atomic number
atomic number = number of protons = number of electrons (neutral)

column or group (family): elements in a group have the same number of valence electrons and have similar physical and chemical properties; elements together in a group are most similar, e.g. F and Cl (VIIA)

Type	Physical Properties
metal	shiny, malleable; good conductor, ductile, malleable, shiny
nonmetal	brittle, dull
metalloid	along the diagonal line; semiconductor under some conditions

TRENDS OF CHEMICAL PROPERTIES

oxidation number: number assigned to an atom or ion in a substance; represents the number of electrons gained or lost; sum to 0 for neutral compound

Example: Fluorine gains 1 electron → anion F⁻ (oxidation number -1)
 Calcium loses 2 electrons → cation Ca²⁺ (oxidation number +2)

Group	Description and Oxidation Number(s)
IA	very reactive metal; wants to lose 1 electron; +1
IIA	reactive metal; wants to lose 2 electrons; +2
III-VIIA	reactive nonmetal; wants to gain 1 electron; -1
0	noble gas (not readily reactive) nonmetal; has full outer shell (8 valence electrons except He has 2); 0
Transition metals	metal in table's center; has partially filled shell and variable oxidation numbers (like Cu ⁺ or Cu ²⁺)

PERIODIC TRENDS

Property	Description and Trend Direction(s)
atomic radius	as move left to right (protons ↑), electrons attracted inward and radii ↓; as move down column, radii ↑
ionic radius	for anions (gain electrons), ionic radii ↑ (compared to atomic radii); for cations (lose electrons), ionic radii ↓
electronegativity	atom's tendency to attract electrons; ↑ as move left to right (excluding noble gases); ↓ as move down column
ionization energy	energy needed to remove an electron from an atom; ↑ as move left to right; ↓ as move down column

Example: F is most electronegative. noble gases
 oxidation number = -1 (always) VIIIA

Group	13	14	15	16	17	18
Period 2	B	C	N	O	F	Ne
Period 3	Al	Si	P	S	Cl	Ar

SAMPLE PAGE -- Page 1 of 6

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Trends moving down a column → atomic radius increases